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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/619,383	07/14/2003	Liu Zhenduo	ASMINT.048AUS	5433

20995 7590 04/08/2005

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EXAMINER	
BARNES, CRYSTAL J	
ART UNIT	PAPER NUMBER
2121	

DATE MAILED: 04/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/619,383	ZHENDUO ET AL.	
	Examiner	Art Unit	
	Crystal J. Barnes	2121	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-44* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 July 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *27 October 2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. The following is an initial Office Action upon examination of the above-identified application on the merits. Claims 1-44 are pending in this application.

Priority

2. Applicant has complied with the conditions for receiving the benefit of an earlier filing date under 35 U.S.C. 119(e).

Information Disclosure Statement

3. The examiner is considering the information disclosure statements (IDS) submitted on 27 October 2003.

Drawings

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "501" has been used to designate both outer loop controller (first occurrence on page 9 [0043]) and hybrid control system (first occurrence on page 11 [0047]).

5. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "251" and "260" have both been used to designate digital filter on page 7 [0039] and in figure 2, respectively.

6. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "1366" and "1368" have both been used to designate block in figure 13 and on page 31 [0091], respectively.

7. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: reference numbers 1211, 1221, 1223 and 1234 in figure 12 and reference numbers 1312, 1314, 1316, 1330 and 1350 in figure 13.

8. The drawings are objected to because figure 16 is unclear and figure 17 is not mentioned in the detailed description.

9. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in

compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

10. The disclosure is objected to because of the following informalities: reference characters "1220" and "1222" have both been used to designate adder on page 22 [0074]. Appropriate correction is required.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

12. Claims 1-44 are rejected under 35 U.S.C. 102(b) as being anticipated by USPN 6,222,164 B1 to Stoddard et al.

As per claim 1, the Stoddard et al. reference discloses a temperature control system for a thermal reactor having a process chamber, the control system comprising: a first control loop (see figure 14) comprising a conventional controller (see columns 22-23 lines 57-5, "spike controller 96") and using a spike temperature sensor ("spike thermocouple 36") signal as input (see column 22 lines 1-4, "spike temperature measurements") for the conventional controller ("spike controller 96"), which provides an output signal (see figure 14, "power setpoint") that controls power to a heating element (see column 7 lines 23-24, "heating elements 30") of a thermal reactor ("thermal reactor 12"), the spike temperature sensor (see column 7 lines 53-56, "spike thermocouple 36") located in proximity to the heating element

("heating elements 30") and spaced from the process chamber ("process tube 14"); and a second control loop (see figure 14) comprising a Model-Based Predictive Controller (see columns 22-23 lines 57-5, "profile controller 98"), using a paddle temperature sensor ("profile thermocouples 42") signal as input (see column 22 lines 4-7, "profile temperature measurements") for the MBPC ("profile controller 98"), which provides as an output a spike temperature control setpoint ("spike set-point control signal") that is used as input (see column 22 lines 1-4, "inputs") for the conventional controller ("spike controller 96") in the first control loop (see figure 14), the paddle temperature sensor (see column 7 lines 63-65, "profile thermocouples 42") spaced from the heating element ("heating elements 30") and located inside or in proximity to the process chamber ("inside the process tube 14").

As per claim 2, the Stoddard et al. reference discloses the conventional controller comprises an H ∞ controller (see column 2 lines 55-58, "H ∞ control").

As per claim 3, the Stoddard et al. reference discloses the conventional controller comprises a PID controller (see column 2 lines 55-58, "PID controllers").

As per claim 4, the Stoddard et al. reference discloses the conventional controller comprises a PID controller ("PID controllers"), said temperature control

system further comprising a PID auto-tuning mechanism ("control theory") that adjusts one or more PID parameters (see column 9 lines 7-13, "parameters") as a function of temperature control setpoint ("temperature setpoints") and a ramp rate ("ramp rates") of said temperature control setpoint ("temperature setpoints").

As per claim 5, the Stoddard et al. reference discloses further comprising a model identification and data acquisition module (see columns 23-24 lines 66-5, "prediction or estimation") that applies closed-loop control using said conventional controller ("wafer controller 100") during the execution of a model identification recipe ("recipe") that performs a ramp-up ("temperature ramping") of the thermal reactor to one or more stabilization temperatures ("stabilization").

As per claim 6, the Stoddard et al. reference discloses the MBPC controller (see column 21 lines 65-67, "profile controller 98") is provided with one or more linear dynamic models (see column 21 lines 45-50, "three off-line models") that characterize thermal response ("thermal processor") of the thermal reactor ("thermal reactor 12").

As per claim 7, the Stoddard et al. reference discloses said linear dynamic models ("three off-line models"; see column 4 lines 14-25, "first and second

dynamic model") characterize said thermal response over one or more temperature sub-ranges ("first and second temperature range").

As per claim 8, the Stoddard et al. reference discloses fuzzy control logic (see column 15 lines 1-7, "logic architectures") is applied to bring about a relatively smooth transition from a first linear dynamic model ("first dynamic model"), operative in a first temperature sub-range ("first temperature range"), to a second linear dynamic model ("second dynamic model"), operative in a second temperature sub-range ("second temperature range").

As per claim 9, the Stoddard et al. reference discloses the MBPC ("profile controller 98") comprises a trajectory planner (see column 15 lines 18-20, "enhanced ramp trajectory logic") which automatically reduces a specified ramp rate ("ramp-up/ramp-down temperature value generator 1145") when approaching a constant temperature control setpoint (see column 15 lines 26-31, "temperature set-point input value").

As per claim 10, the Stoddard et al. reference discloses the output of the MBPC controller ("profile controller 98") is limited by a static model (see column 21 lines 45-50, "off-line model"), said static model ("off-line model") describing a relationship between spike temperature ("spike thermocouple") and paddle

temperature ("profile thermocouple") under relatively steady-state conditions (see column 21 lines 62-64, "steady-state conditions").

As per claim 11, the Stoddard et al. reference discloses the static model is a fourth order model (see column 21 lines 45-50, "spike thermocouple vs. profile thermocouple model").

As per claim 12, the Stoddard et al. reference discloses a signal from a failed temperature sensor (see column 19 lines 40-43, "failed input value") is replaced by a soft-sensor signal ("virtual temperature sensor") computed by a soft-sensor module (see column 19 lines 45-48, "virtual thermocouple logic 2190") from at least data obtained from a functioning temperature sensor (see column 19 lines 43-45, "profile and spike thermocouple values").

As per claim 13, the Stoddard et al. reference discloses said soft-sensor module ("virtual thermocouple logic 2190") comprises a dynamic model (see column 20 lines 5-10, "dynamic thermocouple models").

As per claim 14, the rejection of claim 1 is incorporated and further claim 14 contains limitations recited in claim 1; therefore claim 14 is rejected under the same rationale as claim 1.

As per claim 15, the rejection of claim 2 is incorporated and further claim 15 contains limitations recited in claim 2; therefore claim 15 is rejected under the same rationale as claim 2.

As per claim 16, the rejection of claim 3 is incorporated and further claim 16 contains limitations recited in claim 3; therefore claim 16 is rejected under the same rationale as claim 3.

As per claim 17, the rejection of claim 1 is incorporated and further claim 17 contains limitations recited in claim 1; therefore claim 17 is rejected under the same rationale as claim 1.

As per claim 18, the rejection of claim 4 is incorporated and further claim 18 contains limitations recited in claim 4; therefore claim 18 is rejected under the same rationale as claim 4.

As per claim 19, the rejection of claim 6 is incorporated and further claim 19 contains limitations recited in claim 6; therefore claim 19 is rejected under the same rationale as claim 6.

As per claim 20, the rejection of claim 7 is incorporated and further claim 20 contains limitations recited in claim 7; therefore claim 20 is rejected under the same rationale as claim 7.

As per claim 21, the rejection of claim 8 is incorporated and further claim 21 contains limitations recited in claim 8; therefore claim 21 is rejected under the same rationale as claim 8.

As per claim 22, the rejection of claim 9 is incorporated and further claim 22 contains limitations recited in claim 9; therefore claim 22 is rejected under the same rationale as claim 9.

As per claim 23, the rejection of claim 10 is incorporated and further claim 23 contains limitations recited in claim 10; therefore claim 23 is rejected under the same rationale as claim 10.

As per claim 24, the rejection of claim 11 is incorporated and further claim 24 contains limitations recited in claim 11; therefore claim 24 is rejected under the same rationale as claim 11.

As per claim 25, the rejection of claim 12 is incorporated and further claim 25 contains limitations recited in claim 12; therefore claim 25 is rejected under the same rationale as claim 12.

As per claim 26, the rejection of claim 12 is incorporated and further claim 26 contains limitations recited in claim 12; therefore claim 26 is rejected under the same rationale as claim 12.

As per claim 27, the rejection of claim 1 is incorporated and further claim 27 contains limitations recited in claim 1; therefore claim 27 is rejected under the same rationale as claim 1.

As per claim 28, the rejection of claim 1 is incorporated and further claim 28 contains limitations recited in claim 1; therefore claim 28 is rejected under the same rationale as claim 1.

As per claim 29, the rejection of claim 2 is incorporated and further claim 29 contains limitations recited in claim 2; therefore claim 29 is rejected under the same rationale as claim 2.

As per claim 30, the rejection of claim 3 is incorporated and further claim 30 contains limitations recited in claim 3; therefore claim 30 is rejected under the same rationale as claim 3.

As per claim 31, the rejection of claim 1 is incorporated and further claim 31 contains limitations recited in claim 1; therefore claim 31 is rejected under the same rationale as claim 1.

As per claim 32, the rejection of claim 4 is incorporated and further claim 32 contains limitations recited in claim 4; therefore claim 32 is rejected under the same rationale as claim 4.

As per claim 33, the rejection of claim 6 is incorporated and further claim 33 contains limitations recited in claim 6; therefore claim 33 is rejected under the same rationale as claim 6.

As per claim 34, the rejection of claim 7 is incorporated and further claim 34 contains limitations recited in claim 7; therefore claim 34 is rejected under the same rationale as claim 7.

As per claim 35, the rejection of claim 8 is incorporated and further claim 35 contains limitations recited in claim 8; therefore claim 35 is rejected under the same rationale as claim 8.

As per claim 36, the rejection of claim 9 is incorporated and further claim 36 contains limitations recited in claim 9; therefore claim 36 is rejected under the same rationale as claim 9.

As per claim 37, the rejection of claim 10 is incorporated and further claim 37 contains limitations recited in claim 10; therefore claim 37 is rejected under the same rationale as claim 10.

As per claim 38, the rejection of claim 12 is incorporated and further claim 38 contains limitations recited in claim 12; therefore claim 38 is rejected under the same rationale as claim 12.

As per claim 39, the rejection of claim 12 is incorporated and further claim 39 contains limitations recited in claim 12; therefore claim 39 is rejected under the same rationale as claim 12.

As per claim 40, the rejection of claim 1 is incorporated and further claim 40 contains limitations recited in claim 1; therefore claim 40 is rejected under the same rationale as claim 1.

As per claim 41, the rejection of claim 1 is incorporated and further claim 41 contains limitations recited in claim 1; therefore claim 41 is rejected under the same rationale as claim 1.

As per claim 42, the rejection of claim 1 is incorporated and further claim 42 contains limitations recited in claim 1; therefore claim 42 is rejected under the same rationale as claim 1.

As per claim 43, the rejection of claim 1 is incorporated and further claim 43 contains limitations recited in claim 1; therefore claim 43 is rejected under the same rationale as claim 1.

As per claim 44, the rejection of claim 1 is incorporated and further claim 44 contains limitations recited in claim 1; therefore claim 44 is rejected under the same rationale as claim 1.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following references are cited to further show the state of the art with respect to cascade control in general:.

USPN 6,574,972 B2 to Giacobbe et al.

USPN 6,424,873 B1 to Przybylski

USPN 6,369,716 B1 to Abbas et al.

USPN 6,162,488 to Gevelber et al.

USPN 5,895,596 to Stoddard et al.

USPN 5,697,436 to Johnson et al.

USPN 5,102,331 to Brekke et al.

USPN 4,272,466 to Harris

USPN 3,567,895 to Paz

US Pub. No. 2003/0202910 A1 to Sinha et al.

EP Pub. No. 1 011 037 A2 to VEGTER

JPPN 2004119804 A to TANAKA et al.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Crystal J. Barnes whose telephone number is 571.272.3679. The examiner can normally be reached on Monday-Friday alternate Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anthony Knight can be reached on 571.272.3687. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Crystal J Barnes

CJB
4 April 2005